Guide to

Warwickshire, Coventry and Solihull

Biodiversity Offsetting Biodiversity Impact Assessment Calculator v19.0

For Ecological Consultants

This calculator and guidance was developed for and is for use within Warwickshire, Coventry and Solihull – Please contact the relevant authority before use in other area.

Contents

Please use the most up-to-date version of the BIA calculator at the time of submission:

Email: planningecology@warwickshire.gov.uk

Download: www.warwickshire.gov.uk/biodiversityoffsetting

Biodiversity Offsetting

Biodiversity Offsetting is defined by The Business and Biodiversity Offsets Programme as:

> "*Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate prevention and mitigation measures have been implemented*".

All local planning authorities in the Coventry, Solihull and Warwickshire sub-region require all major and minor scale developments to have undertaken a Biodiversity Impact Assessment (BIA) to determine the likely biodiversity impact of the development, unless otherwise agreed.

How it works

The Biodiversity Impact Assessment (BIA) metric, is a transparent metric used to calculate the biodiversity value of habitat and hedgerows for an application site before and after development. It is a proxy measure to determine if the development will result in an on-site habitat biodiversity net loss or gain.

The BIA is a decision making tool that should be used from the very start of a project and evidences the use of the Mitigation Hierarchy[1].

- Which habitat has been avoided;
- Which habitat has been mitigated;
- Which habitat is to be compensated.

The BIA Tool is for habitats only. Protected and important species will be considered separately within the planning process. However, if a habitat is required to support a protected or important species then the appropriate value of this habitat will need to reflect the species requirements, an example is provided in Box 1.

Box 1:
Great Crested Newts prefer tussock grass; this grassland would be classified at a lower habitat value than grassland managed for wildflowers

Version 19 of the BIA incorporates an Ecosystem Services Analysis dashboard. This is for information only and represents the services Natural Capital provides and how they are likely to be affected by the development based on the habitats inputted into the BIA. The intention is to enabling a decision maker to consider whether a development will make a significant contribution to, or impact on, a particular ecosystem service. Box 2 provides a hypothetical consideration.

[1] Mitigation Hierarchy – paragraph 118 (NPPF)

Box 2:

The Ecosystem Services analysis for an initial draft concept plan shows that Pollination Services will be significantly reduced for a small development within an agricultural setting. To reduce this impact an orchard with a wildflower field layer is proposed. This converts a loss for this ecosystem service into a gain and thereby provides a wider function to the agricultural fields nearby.

Biodiversity Impact Assessment calculator guidance

To be read in conjunction with the Biodiversity Impact Assessment excel calculator v19.0

The calculator consists of the following sheets:

- **Summary**: Brings together the gains and losses into one sheet that is to be submitted within your planning application. It is non-editable.
- **Biodiversity Impact Assessment**: The input sheet for the habitats found on the site to be assessed. This will include the 'red line' (the area needed for the construction and servicing of the application) and any 'blue line' (area in the applicant's ownership). It measures the habitat impacts of a development. It is editable and compulsory.
- **Hedgerow Impact Assessment**: The input sheet for the hedgerows found on the site to be assessed. This will include the 'red line' (area needed for the construction and servicing of the application) and any 'blue line' (area in the applicant's ownership). It measures the hedgerow impact of the development. It is editable and compulsory.
- **Connectivity Impact Assessment:** The input sheet for all the linear features found on the site. It measures the connectivity impacts of a development. It is editable but optional.
- **Habitat Details:** An information sheet that lists the habitats included in respective 'dropdown lists', their description, values, and corresponding multiplier factors. Ecosystem Services values are to be found within the Ecosystem Services sheet. It is non-editable.
- **3 Trading Down sheets:** Defra/Natural England stipulate that a higher Distinctiveness habitat cannot be compensated for by a lower Distinctiveness habitat. This is called trading-down. These sheets calculate if a collective trading-down is occurring and reports it back into the respective Impact Sheet. It is non-editable.
- **Category impacts:** This sheet calculates the impacts for Woodland, Grassland, Wetland, Other and Built Environment broad habitat classifications and reports back into the Biodiversity Impact Sheet and Summary Sheet. It is non-editable.
- **Ecosystem Services:** This sheet calculates the Ecosystem Services impacts associated with the Natural Capital (habitats) losses and gains as a result of the development. The ecosystem service scores delivered by habitat classifications have been derived

from the Oxford University Environmental Change Unit Openness Project[2], through partnership work with Warwickshire County Council and the Habitat Biodiversity Audit Partnership[3]. The outputs are reported in the Summary Sheet. It is non-editable.

- **Biodiversity Compensation:** This sheet calculates the financial contribution Warwickshire County Council is likely to request within an obligation. The factors are based on the Defra Metrics information found in the Habitat Details sheet. They are based on a Precautionary Principle the details of which can be found in Annex A: Biodiversity Offsetting Strategy of the sub-regional Green Infrastructure Strategy[4]. The outputs are reported in the Summary Sheet. It is non-editable.

Required information

The information required to complete the Biodiversity Impact Assessment (BIA) is:

- Habitat type;
- Habitat condition;
- Area or length of each habitat, hedgerow or linear feature;
- Impact from development, both direct (onsite) and indirect (offsite);
- Onsite biodiversity mitigation/enhancement measures.

Ecological surveys to gather this information are to be consistent to CIEEM survey guidance and at an appropriate time of year. The survey and calculation should include the whole of the development boundary (red line) as a minimum. It is encouraged that it includes habitats within the entire ownership boundary (blue line), as ecological compensation can be incorporated within this boundary. All habitat compensation measures within the ownership boundary should be included within the calculation as both existing and proposed habitats.

A development master plan or indicative plan is necessary to inform the BIA as this will determine the habitats that will be in place post development, including habitat to be retained and enhanced. It is essential, therefore, that the ecologist and landscape architect work together. Box 3 illustrates the recommended process when accounting for the biodiversity impacts of a development.

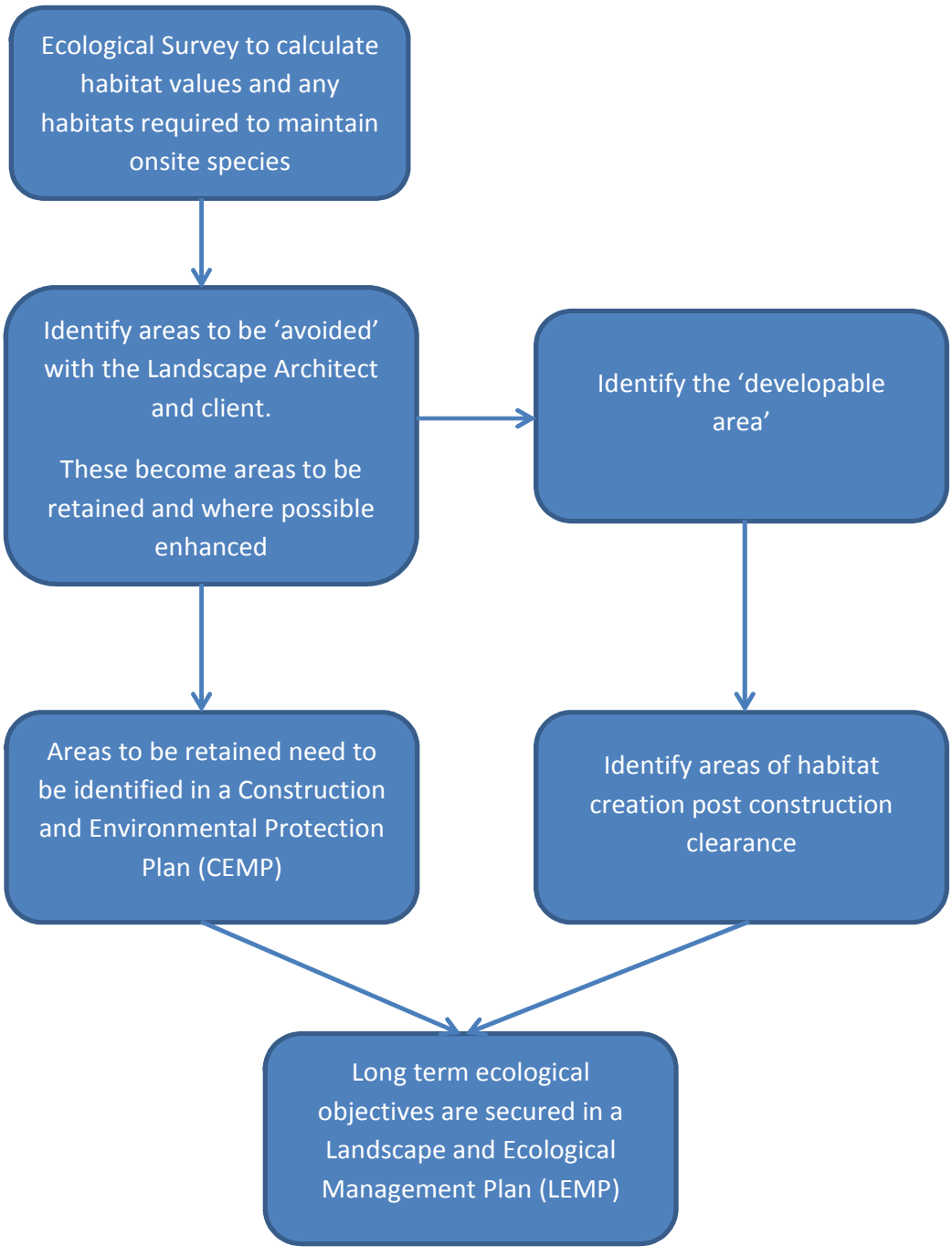
Any habitat is to be cleared or not protected during the works is still entered on the calculator as a habitat loss. If a habitat is to be undisturbed it is entered as an existing habitat on site, in its current condition; then re-entered in the enhancement section as its target habitat and condition.

Although some new habitats such as orchards or plantation are 'created', it may be appropriate to enter these as habitat restoration. For instance if the grassland is to be

[2] http://www.eci.ox.ac.uk/research/ecosystems/bio-clim-adaptation/index.html
[3] https://www.warwickshire.gov.uk/habitatbiodiversityaudit
[4] https://www.warwickshire.gov.uk/greeninfrastructure

retained and not cleared prior to creation works, its value does not need to be replaced; any eventual loss of grassland value to plantation will be gradual with an increase in value of the plantation.

Box 3: Recommended processes for a Biodiversity Impact Assessment.



The completed BIA Summary Sheet and associated Habitat Map should be part of any ecological report submit with the planning application. The whole BIA calculator may be requested to evidence the Summary Sheet, so it is advised to submit the 3 Impact sheets within the appendices of a submitted ecological report.

Impact Assessment Sheets

Habitat Impact Assessment Sheet (a habitat assessment)

Habitats are manually selected via a drop-down list.

The Warwickshire, Coventry and Solihull calculator is primarily based upon JNCC Phase 1[5] habitat definitions; however there are some additional classifications. For clarification and avoidance of doubt the Council has produced habitat definitions within the Habitat Details sheet. It is possible to overwrite the habitat type but you will need to prefix it with "Woodland, Wetland, Grassland or Other" so that the non-editable sheets can identity the habitat broad classification plus input the habitat's distinctiveness and condition scores. Please provide an explanation for these changes in the comment box at the end of the row. However, in these instances you may wish to consult the LPA Ecologist (or WCC Ecology) for assistance.

Area and length

Areas and lengths are to be filled in manually

Area is measured in hectares (ha) and is the area of the habitat either as individual parcels or in combination. When calculating the area of a habitat, calculate to centre line of the boundary feature. Boundaries must not overlap or have gaps. Hedgerows and Connectivity features are the centrelines of the features measured in kilometres (km).

Distinctiveness categories

Distinctiveness scores are automated once a habitat is selected.

Each habitat is given a distinctiveness score as part of its biodiversity value:

- High: 6
- Medium-High: 5
- Medium: 4
- Medium-Low: 3
- Low: 2

The majority of the scores adhere to the Defra scores; however, some have been weighted higher to reflect local importance. The only exceptions are those of the Built Environment habitat types (e.g. Living Walls and Roofs), where the scores may have been elevated to act as an incentive to include them into appropriate developments.

They can be overwritten but please add a comment as to why it has been changed in the comment box associated within the habitat row. Box 4 provides an example where a Distinctiveness Score could be altered.

[5] http://jncc.defra.gov.uk/page-2468

Box 4:

'Grassland: Set-aside/Field Margin' has been selected in the Biodiversity Impact Assessment Sheet and a Distinctiveness Score of 'High' & '6' is auto-filled. However, the margins surveyed are not a nectar or bird seed rich mix but species-poor grassland. In the Biodiversity Impact Assessment Sheet, the inputter changes the blue boxes to 'Low' and a '2' appears in the adjacent box. In the comment box on this row is written "field margin predominated by Yorkshire fog – Low Distinctiveness (c.f. page 45, ABC Ecological Assessment Report, 2018)". A target note reference is also added in the first column labelled "T. Note" that corresponds to the habitat map in the associated report.

Some habitats cannot be created, e.g. unimproved meadows, and therefore will not appear in the drop-down list. These habitats are to be avoided as the Council considers them to be 'irreplaceable' within reasonable timeframes; they should avoided, retained and enhanced/restored.

Condition assessments

Condition scores can primarily to be inputted manually, however some are automated.

The **Habitat Details Sheet** provides which documents are to be used to establish the condition of the habitat being assessed and may detail the criteria there within. However, some habitat types have an automated condition score, otherwise, condition scores within the metric are as follows:

- Good: 3
- Moderate: 2
- Poor: 1

If there are exceptional reasons why a condition assessment was not able to be made for a habitat then a reasonable precautionary approach should be followed and an appropriate condition entered. The reasons for this evaluation must be recorded in the comments area at the end of the respective row and referenced to the corresponding paragraphs and target note on the plan in the accompanying Ecological Report.

For clarification 'Built Environment: Gardens (lawn and planting) gardens' are to be assigned as 'poor' condition (value 1), which reflects the uncertainty as to the long term future management of these habitats. In addition, be reasonable with other proposed habitats; although species rich grassland may be proposed as onsite mitigation within a development, it may never attain a good condition dependant on existing soils and public use pressures.

Hedgerow Impact Assessment Sheet (a Hedgerow assessment)

Natural England has released a Natural England Hedgerow Impact Assessment Guide. However, Warwickshire County Council has made some local amendments. An amended version of the Natural England Guidance document is contained in Appendix A and any WCC amendments have been made clear within the guide.

Connectivity Impact Assessment Sheet (a Linear Feature assessment)

The connectivity sheet is an optional requirement. Its purpose is to enable an applicant to consider if their development will have more or less valuable connective features after the development has finished than is currently on site. This may not mean that there are metres, but what remains is able to function better as a mechanism to move through the development. However, it is only indicative only. Linear features must join other linear features to form connectivity networks and these will depend on the target species that are to use these networks.

Ultimately, the Masterplan or Indicative Layout plans and their landscape reserve matters plus additional features (such as wildlife tunnels under roads or tree 'hop-overs') will clearly illustrate actual connectivity.

Risk factors

Risk factors are automated once a habitat is selected.

Defra/Natural England stipulate the following risk factors:

- **Temporal Factor** (aka Time to target condition): this compensatory factor accounts for the time it takes for a habitat to become fully functional to the prescribed Distinctiveness and Condition.
- **Difficulty of create/restore:** This compensatory factor accounts for the probability of failure for the habitat to establish within the prescribed time or that habitat not becoming what was originally intended.
- **Spatial Factor**: This is an incentivising factor associated to offsite compensation and is not considered in the **Biodiversity Impact Assessment Sheet**. However, it does affect the financial contribution calculation within the **Biodiversity Compensation Sheet**.

The above factors are auto-generated when selecting the habitats to be created or enhanced in the second half of the **Biodiversity**, **Hedgerow** and **Connectivity Assessment Impact Sheets**. These default values are contained in the **Habitat Details Sheet**, where further explanations to why these values have been set. However, they can be overwritten, but justification for this change must be given in the associated comment box.

A detailed management plan will usually be requested through of a Landscape and Ecology Management Plan (LEMP) condition for on-site compensatory habitat. It will detail how

each habitat will be successfully created, enhanced and managed in the long term so as to confirm the target distinctiveness, condition and risk factors. It is recommended that the LEMP, whilst conforming to British Standards 4020, should include the information requested for the discharge of a Biodiversity Offsetting Management Plan obligation including contractual terms. The plan may be monitored and enforced so all habitat descriptions must be precise and management prescriptions achievable.

Guidance on trading of habitats

Within *Technical Paper: the metric for the biodiversity offsetting pilot in England*, Defra, March 2012, Defra discusses the trading of habitat (the compensation of loss of one habitat with creation of another) as follows:

> *"One of the guiding principles for developing our approach to offsetting is that it should result in an improvement in the extent or condition of the ecological network. To do this the focus of habitat restoration or creation through offsetting should be on priority habitats. Where development is taking place on habitats in the low distinctiveness band, the offset actions should result in expansion or restoration of habitats in the medium or, preferably, high distinctiveness band.* ***At no time should an offset result in "trading down", for instance in the replacement of habitat of high distinctiveness with creation or restoration of a habitat of medium distinctiveness.*** *Habitats that are of high distinctiveness would generally be expected to be offset with "like for like" i.e. the compensation should involve the same habitat as was lost."*

The three **Trading Down Correction Sheets** assess the impacts automatically and comply with the Defra / Natural England guidance, with one exception. They, currently, combine all high to low habitat values irrespective of their broad habitat classifications. The results feed back to the **Biodiversity**, **Hedgerow** and **Connectivity Impact Assessment Sheets**.

In essence, low distinctiveness habitat losses can be compensated for by other low distinctiveness habitat (such as gardens and amenity areas). However, any excess low distinctiveness cannot compensate for higher value habitat residual losses. The same philosophy applies with medium-low to medium valued habitats and so forth.

Biodiversity Impact Assessment – Summary Sheet

Habitat Impacts

The summary sheet provides information on the onsite and indirect impacts of the development; positive and negative. It enables recognition to any retained and created habitat as well as habitat lost. It not only highlights gains and losses as a whole, but also breaks these gains and losses into Habitat Types of Woodland, Grassland, Wetland and Other, plus any trading down losses.

The sheet will also calculate an indicative cost to compensate for any losses, based on the Warwickshire County Council financial calculator using the criteria outlined in Annex A of the Green Infrastructure Strategy. Losses are based on percentage losses of each habitat type where

a) Other losses are transferred to primarily Wetland offsetting, and
b) Trading down is distributed proportionally across the habitat types that have losses.

Hedgerow Impacts

Hedgerow Impacts are considered separately and are not transferable to the above habitats. This is because they are measured in linear kilometres and not hectares. They are mathematically non-comparable.

Summary of Impacts

The overall impacts are summarised under the Summary heading detailing the impacts and indicative compensation costs for any losses, but also notes the gains. The financial contributions will be those expected to be referenced in any obligation or as an informative accompanying a condition.

Ecosystem Services

The Millennium Ecosystem Assessment defined Ecosystem Services as "*the benefits people derive from ecosystems".* Besides provisioning services or goods like food, wood and other raw materials, plants, animals, fungi and micro-organisms provide essential regulating services such as pollination of crops, prevention of soil erosion and water purification, and a vast array of cultural services, like recreation and a sense of place..

In spite of the ecological, cultural and economic importance of these services, ecosystems and the biodiversity that underpins them are still being degraded and lost at an unprecedented scale. One major reason for this is that the value (importance) of ecosystems to human welfare is still underestimated and not fully recognized in every day planning and decision-making, in other words, the benefits of their services are not, or only partly, captured in conventional market economics. Furthermore, the costs of externalities of economic development (e.g. pollution, deforestation) are usually not accounted for, while inappropriate tax and subsidy (incentive) systems encourage the over-exploitation and unsustainable use of natural resources and other ecosystem services at the expense of the poor and future generations (Commission of Ecosystem Management, 2018)[6]. Additional, information on Ecosystem Services can be found in the Sub-regional Green Infrastructure Strategy.

The charts within the Summary Sheet are an attempt to introduce ecosystem services into planning and decision-making. Each development will affect the services flowing from the natural capital (in this case habitat) it destroys, enhances or creates. Whether the losses of any service delivery is significant enough to affect an approval or refusal of a development will depend on each site and what is important within that parish, district, county or region. For example, if a development removes one of the last pollinating servicing habitat in a predominately arable landscape and does not compensate for this loss then may be considered significant enough to warrant a refusal, due to the potential economic losses of the surrounding crops. In this instance the applicant may look to promote habitat creation on site that has high pollinating services. These values can be found in the **Ecosystem Services** sheet.

It must be noted that the assessment used in the current Version 19.0 is not comprehensive; for examples,

- it does not add a regulating multiplier factor to habitat within a sustainable drainage feature or a flood zone, or
- increase cultural values of habitat visible or accessible to the public.

These intuitive factors are being considered by current Natural England funded research and will be incorporated into future versions once reviewed by peers.

Therefore, the ecosystem service charts are presented in Version 19.0 as an illustration to Ecosystem Services impacts, loss and gains and are to be used by the applicant and their

[6] Extraction from the Commission's website: https://www.iucn.org/commissions/commission-ecosystem-management/our-work/cems-thematic-groups/ecosystem-services

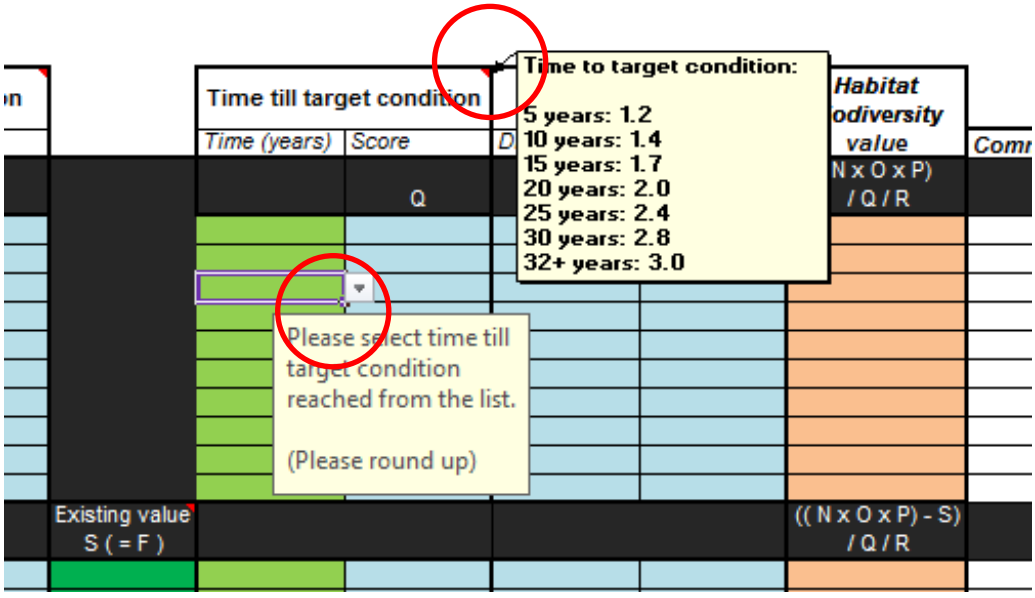
ecological advisors as discussion points during the design of the build. By considering how the new build fits into the wider Green Infrastructure and landscape one can consider which ecosystems are valuable and thus which are retained, enhanced or can be lost.

Pictorial Guide to Completing the WCS Biodiversity Impact Assessment calculator

- The calculator is colour coded to show which cells are for manual input, automatically filled or a calculation.

KEY	
	No action required
	Enter value
	Drop-down menu
	Calculation
	Automatic lookup
	Result

- Additional guidance is provided within the dropdown boxes procedure or in red comment tabs.



Warwickshire County Council offers a Discretionary Advice Service (fee payable) that will assess the correctness of a BIA, which may provide certainty as to what will be expected from a development. However, quick resolvable queries will be provided by contacting the relevant Ecological Advisor:

Warwickshire County Council, Rugby Borough Council, Stratford-on-Avon District Council or Warwick District Council contact WCC Ecological Services:

- 01926 418060
- planningecology@warwickshire.gov.uk

For Solihull Metropolitan Borough Council contact SMBC Ecology:

- 0121 704 6589
- jennifer.blakeman@solihull.gov.uk

For Coventry City Council contact

- 02476 832172
- vanessa.evans@coventry.gov.uk

For Nuneaton and Bedworth Borough Council contact

- 02476 376429
- matt.crossley@nuneatonandbedworth.gov.uk

Existing site

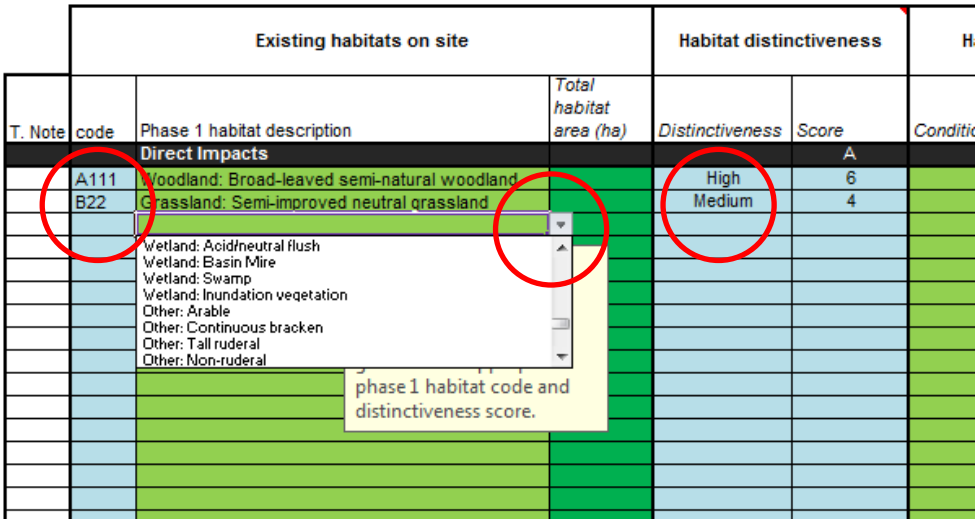
Step 1. Site details

- Fill in the appropriate details of yourself and the development, amending the date and user with subsequent revisions. The Local Authority Area is within a Dropdown list

Local Planning Authority:	
Site name:	
Planning application reference number:	
Assessor:	
Date:	

Step 2. Habitats

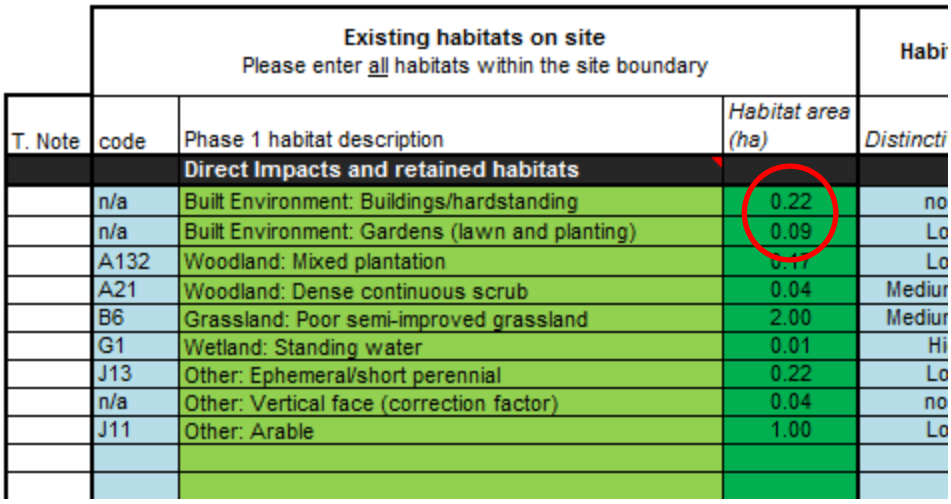
- Use the dropdown menu select the habitats present on site. Enter all habitats within the site boundary.
  - Habitats are grouped under:
    i. Built environment;
    ii. Woodland;
    iii. Grassland;
    iv. Wetland;
    v. Other.
  - Similar habitats in different conditions must be entered in different rows on the calculator;
  - One habitat with differing impacts (part lost, part retained), can be entered on the same row.



- The appropriate phase 1 habitat code and distinctiveness category will then fill in automatically.
- If target notes are available from the survey map and correspond to these habitats they can be entered on the left.

Step 3. Area

- Enter the total area of each habitat in hectares (ha).
    - The area of each habitat must go to the centre of the habitat boundary such that linear features have no area but are calculated by length.



Step 4. Distinctiveness

- This category will be completed automatically once the habitat is selected and follows distinctiveness guidelines as set for the sub-region by a technical panel of local experts.

	Existing habitats on site Please enter all habitats within the site boundary			Habitat distinctiveness		Habitat condition		H v
T. Note	code	Phase 1 habitat description	*Habitat area (ha)*	*Distinctiveness*	*Score*	*Condition*	*Score*	*A*
		Direct Impacts and retained habitats			A		B	
	n/a	Built Environment: Buildings/hardstanding	0.22	none	0	Poor	1	
	A112	Woodland: Broad-leaved plantation	0.09	Medium	4	Moderate	2	

- Should you believe that there is sufficient evidence to indicate an alternative distinctiveness you can overwrite the 'Distinctiveness' box, the score will correct itself and the box will change colour as a reminder that a justification comment is required.

	Existing habitats on site Please enter all habitats within the site boundary			Habitat distinctiveness		Habitat condition	
. Note	code	Phase 1 habitat description	*Habitat area (ha)*	*Distinctiveness*	*Score*	*Condition*	*Score*
		Direct Impacts and retained habitats			A		B
	n/a	Built Environment: Buildings/hardstanding	0.22	none	0	Poor	1
	A112	Woodland: Broad-leaved plantation	0.09	High	6	Moderate	2

Step 5. Condition

- If habitat condition is automated the box will turn blue and be filled.
- Otherwise, Use the dropdown menu to enter the current condition of each habitat parcel as assessed using the prescribed criteria contained in the Habitat Details sheet and your survey results.
    - This will automatically fill in the condition score.
    - You must provide reasoning of your condition determination.

Phase 1 habitat description	*Total habitat area (ha)*	*Distinctiveness*	*Score*	*Condition*	*Score*
Direct Impacts			A		B
Woodland: Broad-leaved semi-natural woodland	5.00	High	6	Moderate	2
Grassland: Semi-improved neutral grassland	23.00	Medium	4	Poor	1

Step 6. Areas of direct impact

- In the appropriate columns (labelled C, E) enter how much of each habitat is to be:
    - C - Retained with no change in management or to be maintained in current condition.
    - E - Retained and enhanced with long-term management.

Habitat Biodiversity Value					
Habitats to be retained with no change within development		**Habitats to be retained and enhanced within development**		**Habitats to be lost within development**	
Area (ha)	*Existing value*	*Area (ha)*	*Existing value*	*Area (ha)*	*Existing value*
C	A x B x C = D	E	A x B x E = F	G	A x B x G = H
0.00		4.00	48.00	1.00	**12.00**
0.00		8.00	32.00	15.00	**60.00**

- Column G will automatically calculate the area of habitat to be lost
- Biodiversity value for each habitat is calculated in the adjacent column. Note: if this column reads '#VALUE!' an input cell in that row has not been adequately completed.

- Totals are visible at the bottom of the table together with the total biodiversity value of the site.

Step 7. Areas of indirect negative impact

- By that same process a steps 1-5 enter any habitat on site and within the vicinity that will be indirectly impacted upon by the development. These could be habitats outside of the site ownership such as,
  - adjacent woodland, which may lose condition due to an increase in light, noise or vibration levels from traffic or other activities resulting from the proposal.
  - A grassland (or other habitat) that will be subsequently predated upon by cats, dogs and human recreation.
  - Nitrous dioxide deposition on grassland habitat
  - A connected river is dewatered or receives less flow or wetland area is partially drained or flooding increased intentionally as a flood risk solution.
- In most cases the habitat will remain the same so only the condition values will change. However, in some instances the habitat distinctiveness will alter as well as the condition.
- <u>This section is not for habitat enhancement</u>. On site habitat enhancement should be entered as per steps 6 and 10. Any pre-agreed offsite enhancements or biodiversity offsetting schemes will have to be calculated separately, taking into account appropriate risk factors and strategic location, please inform the Local Government Ecologist.

Before/after impact	Indirect Negative Impacts Including off site habitats	K					Value of loss from indirect impacts K x A x B = Li, Lii	Li - Lii	
Before	Woodland: Broad-leaved semi-natural woodland	0.10	High	6	Good	3	1.80	0.60	A111
After	Woodland: Broad-leaved semi-natural woodland		High	6	Moderate	2	1.20		
Before									
After									

On completion of Steps 6-7 a **Habitat Impact Score (HIS)** is generated and shows the biodiversity value of all habitats to be negatively impacted by this development.

	HIS = J + M
Habitat Impact Score (HIS)	1.12

Note: If any High Distinctiveness habitat is to be impacted upon a WARNING note will appear beneath the Habitat Impact Score. It will be necessary to provide clear rationale as to why this habitat could not be avoided in accordance with the Mitigation Hierarchy.

Failure to do so may show non-conformity to the National Planning Policy Framework and Local Plan policies.

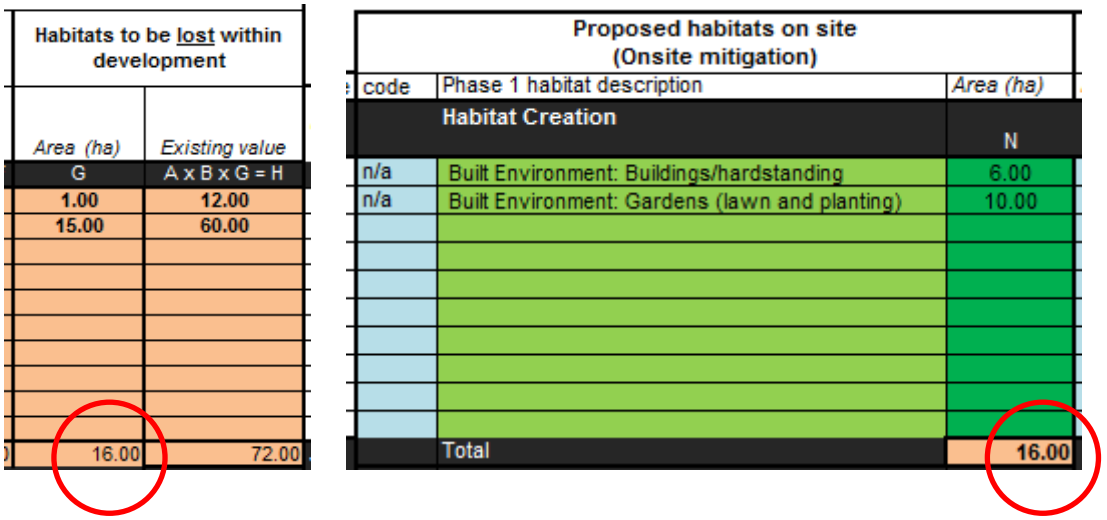
Future site

The next steps are to enter the future habitats on the site as indicated on the masterplan or indicative plan.

Step 8. Habitats created within the development

- Following the same procedure as steps 1-5, select the created habitats from the drop down list. This will automatically fill in the appropriate distinctiveness.

- Fill in the proposed area of each habitat and select the appropriate target condition.



Habitats to be lost within development	
Area (ha)	*Existing value*
G	A x B x G = H
1.00	12.00
15.00	60.00
16.00	72.00

Proposed habitats on site (Onsite mitigation)		
code	Phase 1 habitat description	*Area (ha)*
	Habitat Creation	N
n/a	Built Environment: Buildings/hardstanding	6.00
n/a	Built Environment: Gardens (lawn and planting)	10.00
	Total	16.00

- The total area of habitats created must match that of the habitats lost. If not an error message will appear next to the total calculation box.

Step 9. Risk factors

- Time to target condition: Using the drop down menu select the amount of time it will take, under appropriate management, for each habitat to reach its target condition.
    i. 3 years: factor 1.1
    ii. 5 years: factor 1.2
    iii. 10 years: factor 1.4
    iv. 15 years: factor 1.7
    v. 20 years: factor 2.0
    vi. 25 years: factor 2.4

vii. 30 years: factor 2.8

viii. 32+ years: factor 3.0

Reasoning on this selection should be included where appropriate.

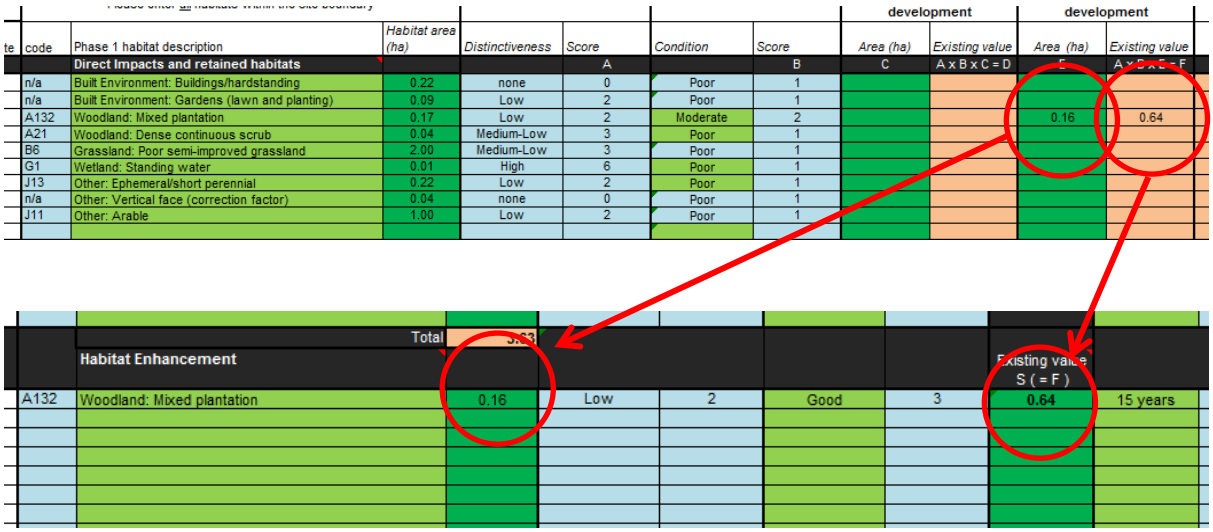
- Difficulty in creation/restoration: The typical difficulty in restoring/enhancing or creating each habitat will fill in automatically when the habitat is selected:
    i. Very high: factor 10
    ii. High: factor 3
    iii. Medium: factor 1.5
    iv. Low: factor 1

    For each habitat this can be different for whether a habitat is being created or restored/enhanced. The values are shown in the Habitat Details sheet.

    Given the particular conditions of each site, such as soil conditions and nutrients, it may be appropriate to amend these factors. A satisfactory explanation must be provided in each instance.

Step 10. Habitats created within the development

These should take account of all areas which are to be retained on site during and post development, and which are to be put under improved management and enhanced/restored. These habitats and areas must accord with the habitats marked for enhancement in the first section.



te	code	Phase 1 habitat description	Habitat area (ha)	Distinctiveness	Score	Condition	Score	development Area (ha)	development Existing value
		Direct Impacts and retained habitats			A		B	C	A x B x C = D
	n/a	Built Environment: Buildings/hardstanding	0.22	none	0	Poor	1		
	n/a	Built Environment: Gardens (lawn and planting)	0.09	Low	2	Poor	1		
	A132	Woodland: Mixed plantation	0.17	Low	2	Moderate	2		
	A21	Woodland: Dense continuous scrub	0.04	Medium-Low	3	Poor	1		
	B6	Grassland: Poor semi-improved grassland	2.00	Medium-Low	3	Poor	1		
	G1	Wetland: Standing water	0.01	High	6	Poor	1		
	J13	Other: Ephemeral/short perennial	0.22	Low	2	Poor	1		
	n/a	Other: Vertical face (correction factor)	0.04	none	0	Poor	1		
	J11	Other: Arable	1.00	Low	2	Poor	1		

		Total	3.33						
	Habitat Enhancement								
A132	Woodland: Mixed plantation	0.16	Low	2	Good	3	0.64	15 years	

If two separate habitats marked for enhancement in the first section are to be enhanced to the same habitat and condition they can be entered separately within this enhancement section, or else their existing value added up appropriately.

- Follow steps 2-5 above for the habitats enhanced within the development
- Enter the target habitat type from the drop down box.

- This will automatically fill in the distinctiveness and difficulty.

Note: the target habitat type can be different and of a higher distinctiveness to the original. For examples, improved grassland could be enhanced to semi-improved grassland or mixed woodland to broad-leaved semi-natural woodland through selective thinning.

- Enter the appropriate area and select the target condition.
  - The area must match corresponding habitat to be enhanced above.

Note: The Defra Guidance suggests that target condition should only be one step up from the original unless robust reasoning can with support of the management plan.

Step 11. Existing value of enhancement habitats

- The existing value of each habitat to be enhanced must be entered such that the biodiversity gain of the enhancement works can be calculated.
  - Tip: You can do this by entering the formula "=cell", such that it re-enters the respective existing biodiversity value 'F' of that habitat. E.G. =M15
  - Biodiversity value for each habitat is calculated in the column before comments. Note: if this column reads '#VALUE!' an input cell in that row has not been adequately completed.

Existing habitats on site		Habitat distinctiveness		Habitat condition		Habitat Biodiversity Value: Habitats to be retained with no change within development		Habitats to be retained and restored within development		Habitats to be lost within development	
Phase 1 habitat description	Total habitat area (ha)	Distinctiveness	Score	Condition	Score	Area (ha)	Existing value	Area (ha)	Existing value	Area (ha)	Existing value
Direct Impacts			A		B	C	A x B x C = D	E	A x B x E = F	G	A x B x G = H
Woodland: Broad-leaved semi-natural woodland	5.00	High	6	Moderate	2	0.00		4.00	48.00	1.00	12.00
Grassland: Semi-improved neutral grassland	23.00	Medium	4	Poor	1	0.00		8.00	32.00	15.00	60.00
Total	28.00					0.00	0.00	12.00	80.00	16.00	72.00
											∑D + ∑F + ∑H
									Site Biodiversity Value		152.00
									Habitat Impact Score (HIS)		72.00

Proposed habitats on site (Onsite mitigation)		Target habitats distinctiveness		Target habitat condition			Time till target condition		Difficulty of creation / restoration		*Habitat biodiversity value*
Phase 1 habitat description	Area (ha)	Distinctiveness	Score	Condition	Score	Existing value S (= F)	Time (years)	Score	Difficulty	Score	((N x O x P) - S) / Q / R
Habitat Restoration											
Woodland: Broad-leaved semi-natural woodland	4.00	High	6	Good	3	=M15			Low	1	#VALUE!
Grassland: Unimproved neutral grassland	8.00	High	6	Moderate	2				Low	1	#VALUE!
Total	44.00								Onsite Compensation Score (OCS)		#VALUE!

Step 12. Complete the risk factors as step 9 above

- If any trading down of habitats has occurred a correction value will automatically be entered to account for this in the Habitat Mitigation Score.

On completion of Steps 8-12 a **Habitat Mitigation Score (HMS)** is generated and shows the biodiversity gain from the habitat created and enhanced, taking into account the necessary risk factors and any down trading of habitat value.

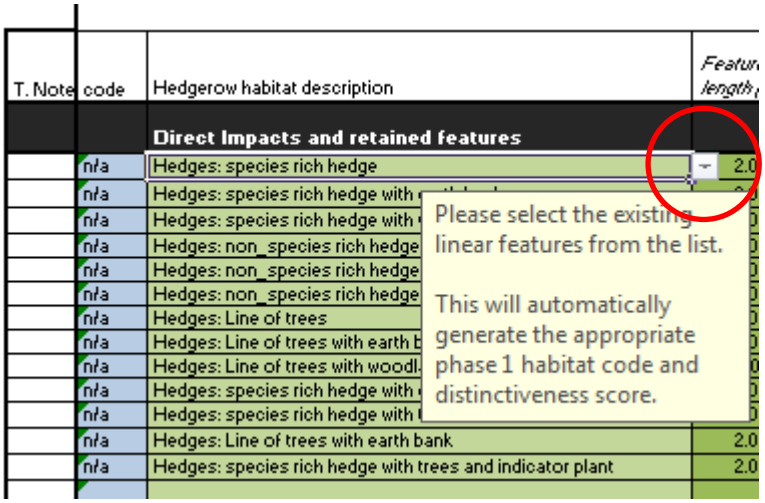
Habitat Biodiversity Impact Score

- The **Habitat Impact Score** is subtracted from the **Habitat Mitigation Score** to give the **Habitat Biodiversity Impact Score**. This is the impact to Habitat biodiversity as a result of the development.
    - If the score is positive the box will turn green and means a habitat biodiversity net gain.
    - If the score is negative the box will turn red and means a habitat biodiversity net loss.

Pictorial Guide to Completing the WCS Hedgerow Impact Assessment Calculator

Step 1. Hedgerows

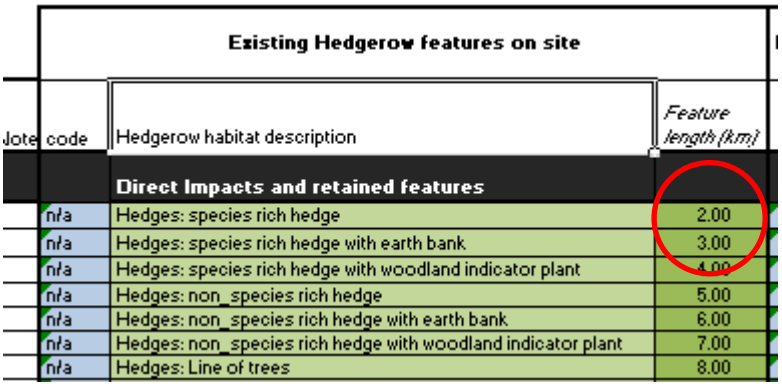
- Using the dropdown menu select the hedge present on site. Enter all habitats within the site boundary.
    - Similar hedges of differing condition must be entered in different rows on the calculator;
    - One hedges with differing impacts (part lost, part retained), can be entered on the same row.



- Any appropriate phase 1 habitat code and distinctiveness category will then fill in automatically.
- If target notes are available from the survey map and correspond to these hedges they can be entered on the left.

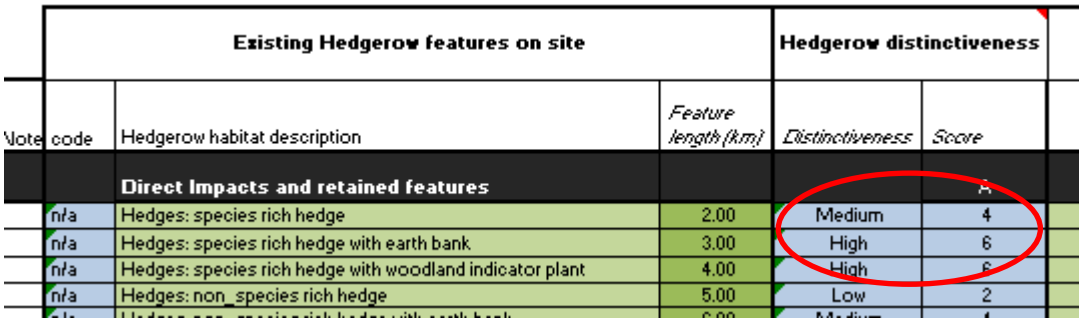
Step 2. Area

- Enter the total length of each hedge in kilometres (km).



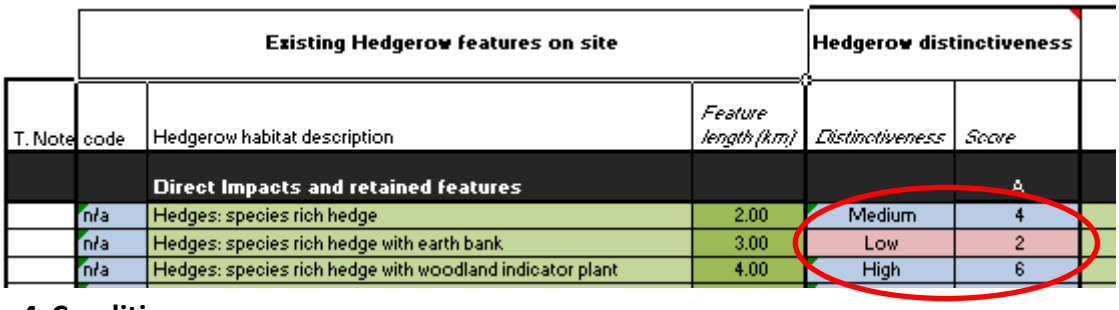
Step 3. Distinctiveness

- This category will be completed automatically using Natural England or Warwickshire County Council assessments.



Note	code	Hedgerow habitat description	Feature length (km)	Distinctiveness	Score
		Existing Hedgerow features on site		**Hedgerow distinctiveness**	
		Direct Impacts and retained features			A
	n/a	Hedges: species rich hedge	2.00	Medium	4
	n/a	Hedges: species rich hedge with earth bank	3.00	High	6
	n/a	Hedges: species rich hedge with woodland indicator plant	4.00	High	6
	n/a	Hedges: non_species rich hedge	5.00	Low	2

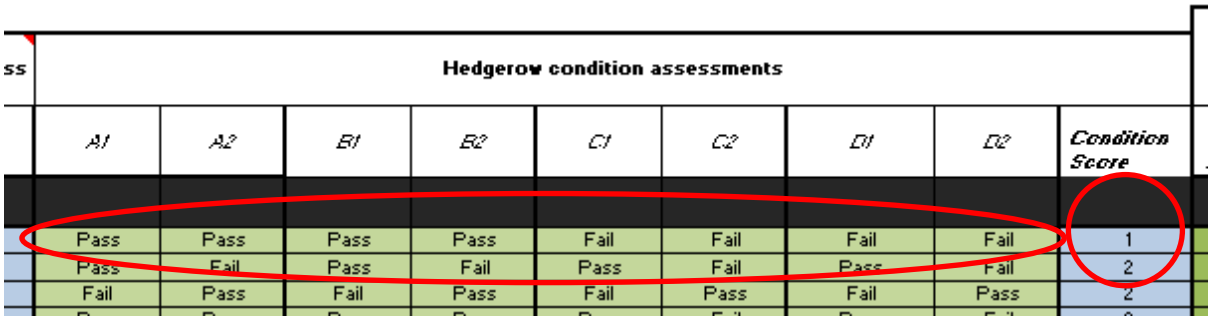
- Should you believe that there is sufficient evidence to indicate an alternative distinctiveness you can overwrite the 'Distinctiveness' box, the score will correct itself and the box will change colour as a reminder that a justification comment is required.



T. Note	code	Hedgerow habitat description	Feature length (km)	Distinctiveness	Score
		Existing Hedgerow features on site		**Hedgerow distinctiveness**	
		Direct Impacts and retained features			A
	n/a	Hedges: species rich hedge	2.00	Medium	4
	n/a	Hedges: species rich hedge with earth bank	3.00	Low	2
	n/a	Hedges: species rich hedge with woodland indicator plant	4.00	High	6

Step 4. Condition

- Using the "Fail" or "Pass" dropdown boxes fill in the results of your hedge assessment from your site visit for each of the assessment criteria layout in the Natural England Hedgerow Impact Assessment Guide (Appendix A)
    - This will automatically fill in the condition score.



ss	A1	A2	B1	B2	C1	C2	D1	D2	Condition Score
	Hedgerow condition assessments								
	Pass	Pass	Pass	Pass	Fail	Fail	Fail	Fail	1
	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	2
	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	2

Step 5. Areas of direct impact

- In the appropriate columns (labelled C, E) enter how much of each hedge is to be:
    - C - Retained with no change in management or to be maintained in current condition.
    - E - Retained and enhanced with long-term management.

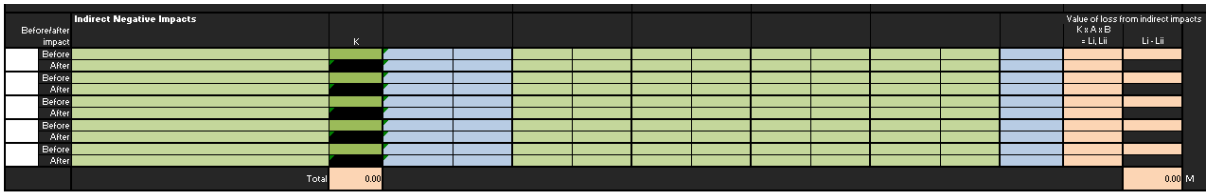
Hedgerow Biodiversity Value						
Hedgerow features to be retained with no change within		Hedgerow features to be retained and enhanced within		Hedgerow features to be lost within development		
Length (km)	*Existing value*	*Length (km)*	*Existing value*	*Length (km)*	*Existing value*	*Comment*
C	A x B x C = D	E	A x B x E = F	G	A x B x G = H	
1.00	4.00	1.00	4.00	1.00	4.00	
		2.00	24.00	1.00	12.00	
		3.00	36.00	1.00	12.00	

- Column G will automatically calculate the area of habitat to be lost
- Biodiversity value for each habitat is calculated in the adjacent column. Note: if this column reads '#VALUE!' an input cell in that row has not been adequately completed.

- Totals are visible at the bottom of the table together with the total biodiversity value of the site.

Step 6. Areas of indirect negative impact

- By that same process a steps 1-5 enter any hedge on site and within the vicinity that will be indirectly impacted upon by the development. These could be habitats outside of the site ownership
- <u>This section is not for habitat enhancement</u>. On site habitat enhancement should be entered as per steps 6 and 10. Any pre-agreed offsite enhancements or biodiversity offsetting schemes will have to be calculated separately, taking into account appropriate risk factors and strategic location, please inform the Local Government Ecologist.



On completion of Steps 6-7 a **Hedge Impact Score (HIS)** is generated and shows the biodiversity value of all habitats to be negatively impacted by this development.

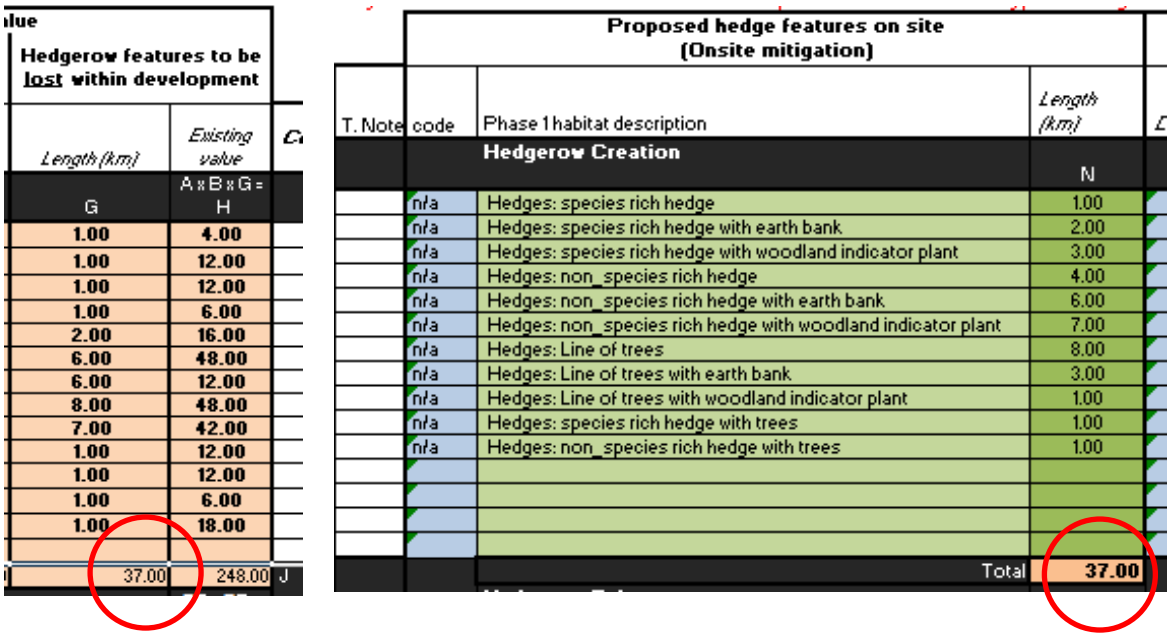
Note: If any High Distinctiveness habitat is to be impacted upon a WARNING note will appear beneath the Habitat Impact Score. It will be necessary to provide clear rationale as to why this habitat could not be avoided in accordance with the Mitigation Hierarchy. Failure to do so may show non-conformity to the National Planning Policy Framework and Local Plan policies.

Future site

The next steps are to enter the future habitats on the site as indicated on the masterplan or indicative plan.

Step 7. Habitats created within the development

- Following the same procedure as steps 1-5, select the created habitats from the drop down list. This will automatically fill in the appropriate distinctiveness.



Hedgerow features to be lost within development		
Length (km)	Existing value	
G	A x B x G = H	
1.00	4.00	
1.00	12.00	
1.00	12.00	
1.00	6.00	
2.00	16.00	
6.00	48.00	
6.00	12.00	
8.00	48.00	
7.00	42.00	
1.00	12.00	
1.00	12.00	
1.00	6.00	
1.00	18.00	
37.00	248.00	J

Proposed hedge features on site (Onsite mitigation)			
T. Note	code	Phase 1 habitat description	Length (km)
		Hedgerow Creation	N
	n/a	Hedges: species rich hedge	1.00
	n/a	Hedges: species rich hedge with earth bank	2.00
	n/a	Hedges: species rich hedge with woodland indicator plant	3.00
	n/a	Hedges: non_species rich hedge	4.00
	n/a	Hedges: non_species rich hedge with earth bank	6.00
	n/a	Hedges: non_species rich hedge with woodland indicator plant	7.00
	n/a	Hedges: Line of trees	8.00
	n/a	Hedges: Line of trees with earth bank	3.00
	n/a	Hedges: Line of trees with woodland indicator plant	1.00
	n/a	Hedges: species rich hedge with trees	1.00
	n/a	Hedges: non_species rich hedge with trees	1.00
		Total	37.00

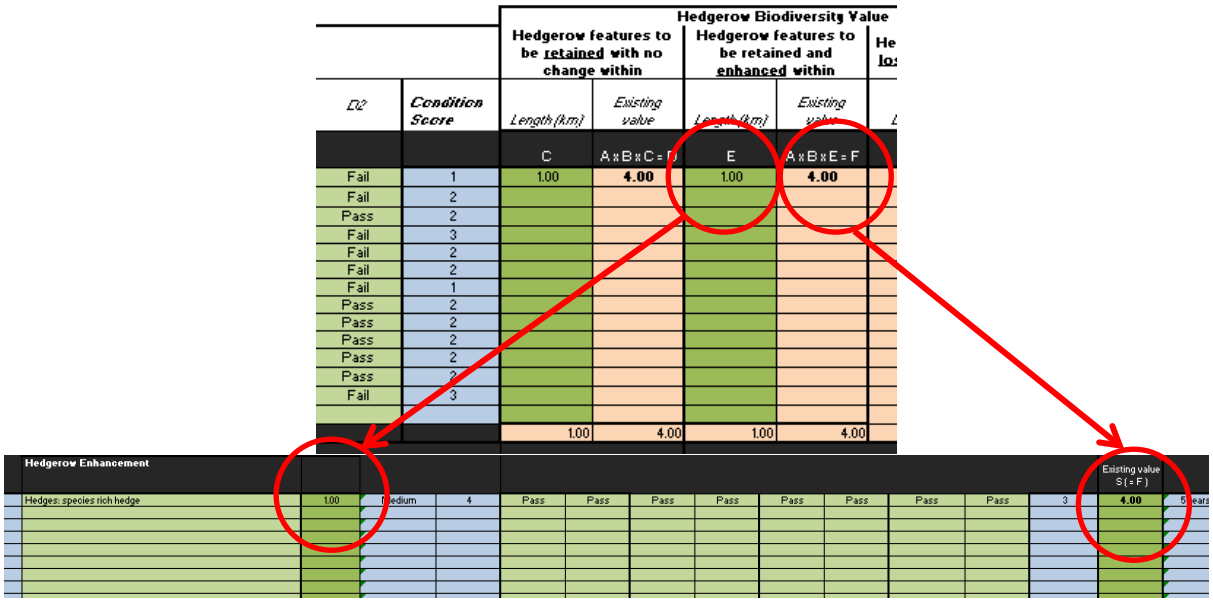
- Fill in the proposed area of each hedge and select the assessment criteria it will "Pass" or "Fail" as layout in the Natural England Hedgerow Impact Assessment Guide
  - This will automatically fill in the condition score.
- The total length of hedge created must match that of the hedge lost. If not an error message will appear next to the total calculation box.

Step 8. Risk factors

- Time to target condition and the Difficulty in creation/restoration risk factors are automated.

Step 9. Hedges created within the development

These should take account of all hedges that are to be retained on site during and post development, and which are to be put under improved management and enhanced/restored. These hedges and areas must accord with the hedges marked for enhancement in the first section.



If two separate hedges marked for enhancement in the first section are to be enhanced to the same hedge and condition they can be entered separately within this enhancement section, or else their existing value added up appropriately.

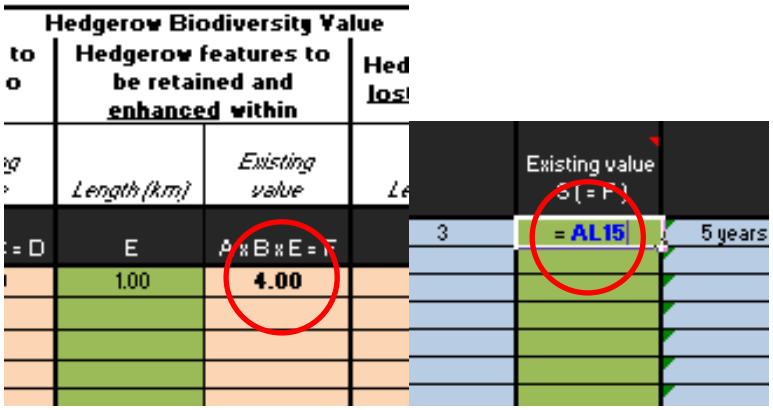
- Follow steps 2-5 above for the hedges enhanced within the development
- Enter the target hedge type from the drop down box.
    - This will automatically fill in the distinctiveness and difficulty.

  Note: the target habitat type can be different and of a higher distinctiveness to the original. For example, species rich hedge could become a species rich hedge with trees.

- Enter the appropriate length and select the target condition assessment crieria.
    - The length must match corresponding length to be enhanced above.

Step 10. Existing value of enhancement hedges

- The existing value of each hedge to be enhanced must be entered such that the biodiversity gain of the enhancement works can be calculated.
    - Tip: You can do this by entering the formula “=cell”, such that it re-enters the respective existing biodiversity value ‘F’ of that habitat e.g. =AL15



- Biodiversity value for each hedge is calculated in the column before comments. Note: if this column reads '#VALUE!' an input cell in that row has not been adequately completed.

Step 11. Complete the risk factors as step 9 above

- Time to Target Condition and the Difficulty in creation/restoration risk factors are automated.
- If any trading down of habitats has occurred a correction value will automatically be entered to account for this in the Habitat Mitigation Score.

On completion of Steps 8-11 a **Hedge Mitigation Score (HMS)** is generated and shows the biodiversity gain from the hedges created and enhanced, taking into account the necessary risk factors and any down trading of hedge value.

Hedge Biodiversity Impact Score

- The **Hedge Impact Score** is subtracted from the **Hedge Mitigation Score** to give the **Hedge Biodiversity Impact Score**. This is the impact to Hedge biodiversity as a result of the development.
  - If the score is positive the box will turn green and means a Hedge biodiversity net gain.
  - If the score is negative the box will turn red and means a Hedge biodiversity net loss.

Pictorial Guide to Completing the WCS Connectivity Impact Assessment Calculator [optional]

This calculator sheet follows similar steps to that of the Habitat Impact Assessment of the **Biodiversity Impact Assessment** sheet

Pictorial Guide to Understanding the Summary Sheet of the WCS Biodiversity Impact Assessment Calculator

The Site name and the Planning reference number will be auto filled from the **Biodiversity Impact Sheet**. The impacts from the development are shown as area/length and value to include for Habitat, Hedgerows and Connective Features:

- Onsite Biodiversity Impact
- Indirect Biodiversity Impact
- Onsite biodiversity retained
- Onsite Creation
- Biodiversity retained and enhanced

These are totalled to demonstrate:

- Total habitat / linear features impacted
- Total biodiversity retained/enhanced
- Trading down, and
- Overall Biodiversity Impact.

Site name: Tomas Land
Planning reference number: W/2018/9876

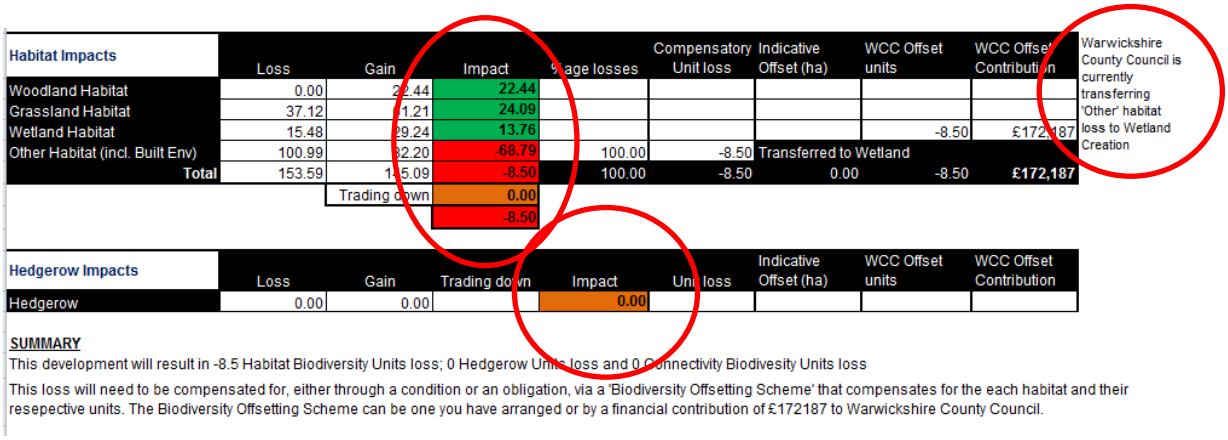
Existing	Habitat Area (ha)	Hedgerow impact (km)	Connectivity Features (km)	Habitat Biodiversity Value	Hedgerow Biodiversity Value	Connectivity Biodiversity Value
Onsite Biodiversity Impact	61.46	0.00	0.00	176.45	0.00	0.00
Indirect Biodiversity Impact	0.00	0.00	0.00	0.00	0.00	0.00
Total habitat / linear features impacted	**61.46**	**0.00**	**0.00**	**176.45**	**0.00**	**0.00**
Retained / Created / Enhanced						
Onsite biodiversity retained	0.16	0.00	0.00	1.92	0.00	0.00
Onsite Creation	61.46	0.00	0.00	138.74	0.00	0.00
Biodiversity retained and enhanced	1.85	0.00	0.00	27.29	0.00	0.00
Total biodiversity retained/enhanced	**63.47**	**0.00**	**0.00**	**167.95**	**0.00**	**0.00**
Trading Down	n/a	n/a	n/a	0.00	0.00	0.00
Biodiversity Impact	**n/a**	**n/a**	**n/a**	**-8.50**	**0.00**	**0.00**

CAUTION - Destruction of habitats of high distinctiveness, e.g. lowland meadow or species-rich hedgerows, may be against local policy. Has the mitigation hierarchy been followed, can impact to these habitats be avoided?

If High Distinctiveness habitat is being impacted upon a caution note will appear to the side of the summary table.

The second table summarises Habitat Impacts broken down into Woodland, Grassland, Wetland and Other Habitat categories. These are colour coded as red (loss), green (gain) and orange (neutral) under the impact column. There are then calculation columns that spread any trading down losses proportionally across any habitat category that has a loss. It also re-allocates the Other Habitat loss to the habitat category currently being prioritised for

creation and/or enhancement. For example, the current priority habitat is wetland to promote the Protected Species Strategy objectives for great crested newt and their Favourable Conservation Status.



Habitat Impacts	Loss	Gain	Impact	%age losses	Compensatory Unit loss	Indicative Offset (ha)	WCC Offset units	WCC Offset Contribution
Woodland Habitat	0.00	22.44	22.44					
Grassland Habitat	37.12	61.21	24.09					
Wetland Habitat	15.48	29.24	13.76				-8.50	£172,187
Other Habitat (incl. Built Env)	100.99	32.20	-68.79	100.00	-8.50	Transferred to Wetland		
Total	153.59	145.09	-8.50	100.00	-8.50	0.00	-8.50	**£172,187**
		Trading down	0.00					
			-8.50					

Warwickshire County Council is currently transferring 'Other' habitat loss to Wetland Creation

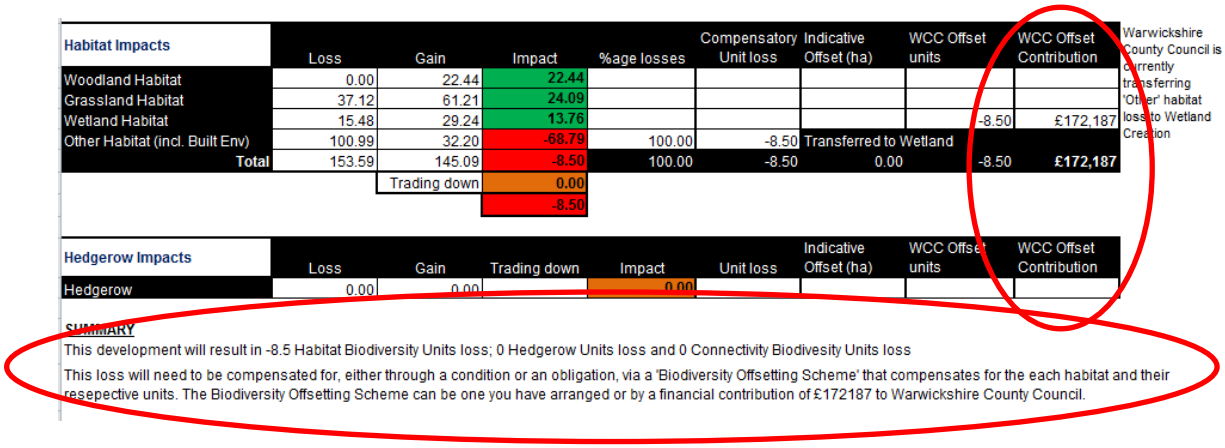
Hedgerow Impacts	Loss	Gain	Trading down	Impact	Unit loss	Indicative Offset (ha)	WCC Offset units	WCC Offset Contribution
Hedgerow	0.00	0.00		0.00				

SUMMARY

This development will result in -8.5 Habitat Biodiversity Units loss; 0 Hedgerow Units loss and 0 Connectivity Biodivesity Units loss

This loss will need to be compensated for, either through a condition or an obligation, via a 'Biodiversity Offsetting Scheme' that compensates for the each habitat and their resepective units. The Biodiversity Offsetting Scheme can be one you have arranged or by a financial contribution of £172187 to Warwickshire County Council.

The value losses are finally converted to an indicative cost to compensate for these losses based on the financial contribution calculations outlined in Annex A of the Green Infrastructure Strategy. The formula and mechanisms for calculating these costs are presented in the **Biodiversity Compensation** sheet.



Habitat Impacts	Loss	Gain	Impact	%age losses	Compensatory Unit loss	Indicative Offset (ha)	WCC Offset units	WCC Offset Contribution
Woodland Habitat	0.00	22.44	22.44					
Grassland Habitat	37.12	61.21	24.09					
Wetland Habitat	15.48	29.24	13.76				-8.50	£172,187
Other Habitat (incl. Built Env)	100.99	32.20	-68.79	100.00	-8.50	Transferred to Wetland		
Total	153.59	145.09	-8.50	100.00	-8.50	0.00	-8.50	**£172,187**
		Trading down	0.00					
			-8.50					

Warwickshire County Council is currently transferring 'Other' habitat loss to Wetland Creation

Hedgerow Impacts	Loss	Gain	Trading down	Impact	Unit loss	Indicative Offset (ha)	WCC Offset units	WCC Offset Contribution
Hedgerow	0.00	0.00		0.00				

SUMMARY

This development will result in -8.5 Habitat Biodiversity Units loss; 0 Hedgerow Units loss and 0 Connectivity Biodivesity Units loss

This loss will need to be compensated for, either through a condition or an obligation, via a 'Biodiversity Offsetting Scheme' that compensates for the each habitat and their resepective units. The Biodiversity Offsetting Scheme can be one you have arranged or by a financial contribution of £172187 to Warwickshire County Council.

A summary of the impacts is provided beneath the impact tables.

An Ecosystem Services analysis in the form of four charts provides an opportunity to consider the services provided by the habitats currently on site against those of development proposal. The first is an overall chart for Provisioning, Regulating and Cultural Services showing Existing (current), After (post development) and gains/losses. The next three charts breakdown sub-topics within the three Service categories of Provisioning, Regulating and Cultural Services and any gains/losses in these topic areas.

Finally, there are contact details for Warwickshire County Council should you wish have any queries.

Note: Warwickshire County Council provides a chargeable Discretionary Advice Service that can provide initial comments on Biodiversity Impact Assessment at any stage of within a development. This service looks to provide 'certainty' in the planning process to enable the development to know how much (if any) compensation will or is anticipated to cost. As any cost is based on reasonable worst case scenario and if the Biodiversity Impact Assessment genuinely reflects what will happen to the site then the cost can be used to within a viability assessment.

Warwickshire County Council

Annex A: Natural England Hedgerow Impact Assessment Guide [Warwickshire, Coventry & Solihull adapted]

Text as red in the following Annex show where Warwickshire County Council has deviated or made additional categories to the Defra Guidance to reflect local considerations.

A Hedgerow Metric for a revised UK Biodiversity Metric

Dave Stone, Matt Heydon, Kathleen Covill, Stephen Panks and the Biodiversity Metric Consortium, February 2018 – Revised May 2018

Introduction

1. When Natural England reviewed the no net loss in biodiversity metric developed by High Speed 2 Ltd (HS2, 2013, 2015) it recommended revisions to the hedgerow component of the metric (Natural England, 2016). As this element of the metric closely followed the hedgerow metric set out in the Defra biodiversity offsetting pilots (Defra, 2012), the recommendations have wider relevance for the use of biodiversity metrics in the UK beyond this specific infrastructure scheme.

2. Natural England (2016) made two key recommendations. First, that an updated multiplier model for hedgerow condition is developed taking account of improved understanding of hedgerow management and experiences of applying the metric in the Defra pilot areas, and second, that the distinctiveness of hedgerows is assessed in the metric. High Speed 2 Ltd were supportive of these recommendations.

3. This paper proposes an updated hedgerow metric to use in place of the metric developed for the Defra offsetting pilots. A further significant revision is underway and likely to adopt the methodology for hedgerows presented below. The benefits of hedgerow restoration and enhancement are not evaluated within the Defra metric, though this has been done in some instances with bespoke work-arounds. The revised metric proposes their inclusion. This amendment brings the hedgerow metric in line with the treatment of area habitats in the Defra metric (Defra, 2012).

4. Working with Natural England, High Speed 2 Ltd supported and contributed to a workshop (May 2017) which brought together experts with knowledge of biodiversity metrics and hedgerows (the 'Biodiversity Metric Consortium'; see Annex A). The range of environmental expertise represented public sector, industry and consultancy sectors. The approach adopted throughout the workshop was to encourage open discussion and debate and then to consolidate through a Delphi process of consensus. Existing models of hedgerow condition metrics such as the Defra Biodiversity Metric (Defra, 2012), the HedgeLink model of condition (Wolton, 2012), and Hedgerow Appraisal System (Foulkes et al, 2013) were presented to stimulate discussions.

5. Workshop participants were challenged to develop a revised hedgerow metric building on the Defra biodiversity metric approach and combining an ecological rational with the simplicity required for practical use in a wide range of development projects. Time constraints meant that the workshop focused on the 'condition' component of the metric but participants gave a clear steer that a revised metric should also evaluate 'distinctiveness'.

6. The workshop outputs formed the basis of the revised hedgerow metric set out below.

Hedgerow metric (revised)

Background

7. Hedgerows are a feature almost unique to the British Isles. There is no experience of dealing with them in offset schemes elsewhere that we can draw on. Hedgerows' contribution to biodiversity in the landscape is greater per unit of area than even the most biodiversity rich habitats because of their role in provision of nest sites, corridors, feeding sites, shelter belts etc. They cannot simply be treated as other habitats and accounted for on an area basis. It is therefore necessary to use an approach to account for hedgerows that recognises their unique contribution to biodiversity whilst meeting the principle of simplicity.

Use and limitations of metrics

8. For any proposed development there are good practice principles that involve consideration of the mitigation hierarchy before considering compensation measures and use of metrics to quantify that compensation (CIEEM, CIRIA & IEMA, 2016).

9. Biodiversity metrics are designed to inform decision-making by providing a simple, quantitative assessment of the biodiversity change expected to result from an intervention or development. The intervention objective should be to deliver no-net-loss or, better still, net gain of biodiversity units in line with the good practice principles.

10. When using biodiversity unit calculations it is important to keep sight of the fact these are <u>not</u> absolute values. The numbers generated are proxies for the relative biodiversity value of the state of a place at T_0 (before intervention / development) and T_1 (after intervention / development). The purpose of the biodiversity unit calculation is to consistently identify the relative change to inform considerations about biodiversity net loss, no net loss or net gain in the context of a development or other intervention. Thus the output of the calculation gives the user a measure of relative change between T_0 and T_1.

11. Metrics themselves do not set targets for biodiversity units at T_1 (after intervention / development). The ambition or target is a political / policy decision by parties shaping and delivering a set of interventions. For example, a 'net gain' policy commitment by a developer can be delivered in a number of different ways. Biodiversity metrics are a tool that indicate the relative value at T_0 and T_1 enabling a developer to see if they are meeting their ambition.

12. Decisions should not be based on the output of metrics in isolation. Decisions also need to:

    a. Take account of expert ecological advice on the appropriate form and species composition of hedgerow compensation measures, and

    b. Consider other relevant matters, including, for example, the historic or landscape significance of a hedgerow, and planning policies.

13. Although this proposal describes proposed revisions to the hedgerow metric a similar approach could be developed for other linear features, such as streams or rivers, and dry stone walls.

Hedgerow metric: principles of application

14. **Essential elements of the metric:** For the purposes of the metric, the biodiversity unit value of a hedgerow depends on its ***length***, its ***distinctiveness***, its ***condition*** and its ***spatial relationship***[1]***.*** Where hedges are being created or restored then the associated ***delivery risks*** also need to be accounted for. There is no delivery risk associated with the assessment of the original hedgerow or with a newly created or restored hedgerow that has achieved its target distinctiveness and condition.

15. **Hedgerows can be created, restored or enhanced:** Compensation for hedgerow losses can be provided by expansion (i.e. planting new hedges) and by restoration or enhancement of existing hedgerows. Measures taken to improve existing hedgerows must provide a significant and demonstrable uplift in distinctiveness or condition (e.g. by using new planting to fill gaps to produce a continuous canopy and / or to increase species diversity and / or extending undisturbed adjacent ground). Good management practice (e.g. periodically laying hedges) does not, by itself, constitute restoration or enhancement. An example of restoration would be the transformation of a derelict hedge comprising of a fence-line with short lengths of hedge and isolated woody plants into a continuous length of dense woody growth comprising a diverse selection of locally appropriate woody plant species.

16. **Only hedgerows**: There is limited science comparing the biodiversity value of hedgerows to other habitats. Even if such evidence was plentiful, it is likely that the exact value would be so dependent on a wide range of factors as to make its use as a generalisation difficult. Consequently it is recommended that hedgerows are accounted for separately from the main area habitat metric. For example, an area of grassland with hedgerows subject to development would have an offset requirement of XX area biodiversity units of grassland plus YY of linear hedgerow biodiversity units.

17. **No 'trading down':** Newly created or restored habitats should result in an improvement in the extent or quality of the habitat affected. Therefore, ideally, new or restored hedgerows should aim to achieve a higher distinctiveness and / or condition than those lost. At no time should compensation measures result in "trading down", for instance in the replacement of a hedgerow of high distinctiveness with creation or restoration of a hedgerow of a lower distinctiveness. Losses of hedgerows of a high distinctiveness are expected to be compensated on a "like for like" basis. This principle also applies to physical characteristics of a hedgerow, for example emergent trees.

18. **Recognise local and special characteristics**:

    a. Newly created and restored hedges should aim to replicate the characteristics of:

        - The hedgerows that have been lost, so a hedge with emergent trees should be replaced with a hedge with a similar density of emergent trees, and

        - Traditional hedge types in the locality, with varied levels of distinctiveness.

    b. Hedgerows bounding green lanes and double hedgerows should be treated as a two hedgerows rather than a single hedge. This distinction recognises that double hedges are known to be particularly important for wildlife (Walker et al., 2005, Walker et al., 2006). Lost double hedgerows are to be compensated with a double hedge.

[1] In the pilot Defra metric spatial location was treated as a *delivery risk* rather than a component of the *quality* of a hedgerow.

c. 'Ecologically valuable' lines of trees may be characterised as mainly comprising native species in a mature state with a well-developed, possibly, continuous canopy along the length of the line. Ecological expert judgement may be required to distinguish 'ecologically valuable' lines of trees in a locality.

19. **Ecologically justified:** The methodology detailed here should be default and is suitable in the majority of circumstances. Deviations, particularly any local or project-specific adaptations, are expected to be exceptions and need to be justified in ecological terms.

Hedgerow types

20. We recommend use of the key and descriptions provided in the Defra 'Hedgerow Survey Handbook' (Defra, 2007) to determine whether or not a feature is a hedgerow (see Annex B). This key recognises three different types of hedgerows: 'shrubby hedgerows', 'shrubby hedgerows with trees' and 'lines of trees'.

21. Any hedgerow, or line of trees, comprising of > 90% non-native structural species (e.g. ornamental species such as privet, *Ligustrum* species[2], or *Cupressus* × *leylandii*) is not regarded as a hedgerow for the purposes of the metric. Such hedgerows do not possess sufficient ecological qualities to merit separate quantification as a hedgerow, but they should be included as part of the main habitat calculated area. If their area is sufficient to be 'mapable' they may be assessed as a habitat in their own right being classified as 'introduced shrub' for example.

Hedgerow distinctiveness

22. Hedgerows are assigned a 'distinctiveness' weighting based on their physical structure and species composition of the woody element of the hedgerow, and their association with physical features (ditches and banks) that may enhance their ecological value by providing additional niches or enhanced capacity to provide habitat connectivity. For the purposes of the metric, 'shrubby hedgerows' and 'shrubby hedgerows with trees' are regarded as sufficiently similar in their ecological distinctiveness to be given the same weighting.

23. Following the approach established by the Hedgerow Survey Handbook (Defra, 2007), a hedgerow is regarded as species rich where the structural species making up a 30m section of hedgerow includes at least five (or at least four in northern and eastern England, upland Wales and Scotland) woody species that are regarded as either native or archaeophytes somewhere in the UK. Climbers and bramble do not count towards the total except for roses[3]. A list of archaeophytes in given in Appendix 11 of 'Hedgerow Survey Handbook'.

24. There is no attempt to evaluate the biodiversity unit value of the ground flora associated with hedgerows – despite its potential relevance - because the limited survey window and the level of botanical expertise required are not compatible with the simplicity principle.

25. We draw a distinction between lines of trees recognised as being of ecological value and other lines of trees. 'Ecologically valuable' lines of trees may be characterised as mainly comprising native species in a mature state with a well-developed, possibly, continuous canopy along the

[2] Excluding *Ligustrum vulgare*, which is a native species of the British Isles

[3] Climbers are an important feature of hedgerows, but are excluded from this criterion as its objective is to ensure a minimum number of species capable of contributing to the woody structure and form of a hedge.

length of the line. This is distinct from say an over-grown or derelict hedge or line of Lombardy Poplar.

26. The distinctiveness weightings assigned to different hedgerow types are set out in Table 1, below.

Table 1: Hedgerow distinctiveness weightings for different hedgerow types (with or without emergent trees) and lines of trees

Associated features	Woody plant structural composition			
	Species rich hedgerow (inc. hedgerow with trees)	Hedgerow	Line of Trees (Ecologically Valuable)	Line of trees
Associated earth bank or ditch or woodland indicator species	6 High	4 Medium	5 Medium -High	3 Medium-Low
None	4 Medium	2 Low	4 Medium	2 low

Non-species rich hedge with Trees : Medium-High (5)
Species rich hedgerow with Trees: High (6)

Hedgerow condition weighting

27. To assess condition we assess the dimensions and other physical characteristics of a hedgerow against a set of minimum requirements for a hedgerow to be considered in a 'favourable' condition.

28. A series of eight 'attributes', representing key physical characteristics, are used for this assessment. The attributes, and the minimum criteria for achieving a 'favourable condition' in each, are set out in Table 2, below. The attributes use similar favourable condition criteria to the 'Hedgerow Survey Handbook' (Defra, 2007) and the handbook is the recommended source of reference for assessing hedgerow attributes.

Table 2: Hedgerow attributes and criteria for meeting 'favourable condition'

Attributes and functional groupings (A, B, C & D)	Criteria (the minimum requirements for 'favourable condition'	Description
A1. **Height**	>1.5 m average along length	The average height of woody growth estimated from base of stem to the top of shoots, excluding any bank beneath the hedgerow, any gaps or isolated trees. Newly laid or coppiced hedgerows are indicative of good management and pass this criterion for up to a maximum

		of four years (if undertaken according to good practice[4]) A newly planted hedgerow does not pass this criterion (unless it is > 1.5 m height)
A2. **Width**	>1.5 m average along length	The average width of woody growth estimated at the widest point of the canopy, excluding gaps and isolated trees. Outgrowths (e.g. blackthorn suckers) are only included in the width estimate when they >0.5 m in height. Laid, coppiced, cut and newly planted hedgerows are indicative of good management and pass this criterion for up to a maximum of four years (if undertaken according to good practice[5])
B1. **Gap – hedge base**	Gap between ground and base of canopy <0.5 m for >90% of length (unless 'line of trees')	This is the vertical gappiness of the woody component of the hedgerow, and its distance from the ground to the lowest leafy growth. Certain exceptions to this criterion are acceptable (see page 65, Defra 2007)
B2. **Gap - hedge canopy continuity**	• Gaps make up <10% of total length and • No canopy gaps >5 m	This is the horizontal gappiness of the woody component of the hedgerow. Gaps are complete breaks in the woody canopy (no matter how small). Access points and gates contribute to the overall gappiness, but are not subject to the >5 m criterion (as this is the typical size of a gate)
C1. **Undisturbed ground and perennial vegetation**	>1 m width of undisturbed ground with perennial herbaceous vegetation for >90% of length ○ measured from outer edge of hedgerow, and ○ is present on one side of the hedge (at least)	This criterion picks up management close to the hedgerow that is likely to damage woody species (e.g. cultivation harming roots) or their associated ground flora (e.g. herbicide use). Hedgerows adjacent to vegetation such as permanent grassland or woodland will normally meet this criterion but should still be assessed.

[4] HedgeLink (http://hedgelink.org.uk/index.php) provides a resource of management advice for hedgerows, and for specific advice on laying and coppicing see Conservation Service (2007).
[5] HedgeLink (http://hedgelink.org.uk/index.php) provides a resource of management advice for hedgerows, and for specific advice on laying and coppicing see Conservation Service (2007).

C2.	**Undesirable perennial vegetation**	Plant species indicative of nutrient enrichment of soils dominate <20% cover of the area of undisturbed ground	The indicator species used are nettles (*Urtica* spp.), cleavers (*Galium aparine*) and docks (*Rumex* spp.). Their presence, either singly or together, should not exceed the 20% cover threshold.
D1.	**Invasive and neophyte species**	>90% of the hedgerow and undisturbed ground is free of invasive non-native and neophyte species	Neophytes are plants that have naturalised in the UK since AD 1500. For information on neophytes see the JNCC website and for information on invasive non-native species see the GB Non-Native Secretariat website.
D2.	**Current damage**	>90% of the hedgerow or undisturbed ground is free of damage caused by human activities	This criterion addresses damaging activities that may have led to or lead to deterioration in other attributes. This could include evidence of pollution, piles of manure or rubble, or inappropriate management practices (e.g. excessive hedge cutting)

29. Each attribute is assigned to one of four functional groups (A – D), as indicated in Table 2 and the condition of a hedgerow is assessed according to the number of attributes from these functional groups which pass or fail the 'favourable condition' criteria according to the approach set out in Table 3.

Table 3: Hedgerow condition assessment and weighting

Condition Assessment	Maximum number of attributes that can fail to meet 'favourable condition' criteria in Figure 2	Weighting (score)
Good	No more than 2 failures in total and no more than 1 in any functional group.	3
Moderate	No more than 4 failures in total and fails both attributes in a maximum of one functional group. *e.g. fails attribute 1 & 2, 5 &7 = moderate condition.* *e.g. fails attributes 1,2,3, & 4 = poor condition*	2
Poor	Fails a total of more than 4 attributes or both attributes in more than one functional group.	1

Spatial location

30. Spatial location is regarded as a delivery risk in the Defra pilot metric (Defra, 2012), and only applied to the provision of compensation habitat (whether restored or newly created). Natural England recommends that in future spatial location is treated as a quality of a habitat, including

hedges. This means that the spatial location of both the impacted and compensation hedgerow habitat needs to be taken into consideration when calculating the hedgerow biodiversity unit (HBU) value. A proposal for applying this in biodiversity metrics is currently being developed. This envisages recognising two distinct spatial elements: connectivity and strategic position, recognising that area and linear habitats will need to be treated differently. Until guidance on spatial location metrics is agreed and published apply a x1 multiplier to these elements in the calculation (effectively leaving them out).

Delivery risks

31. In line with the approach followed for the area habitat metric, where new hedgerows are being created or existing hedgerows restored / enhanced, multipliers are used to manage delivery risks. These multipliers take account of risks by reducing the HBU value of an intervention thus incorporating aspects of the complexity and uncertainty associated with compensate for losses.

Difficulty of creation and restoration

32. The technical difficulty of creating and restoring hedgerows (the risk multiplier) was fixed at 'low' (x 1 multiplier)[6] in the Defra pilot metric (Defra, 2012), which means this risk multiplier does not change the number of HBUs generated by a proposed intervention to compensate for losses. This risk multiplier value is retained as an indicative rating. A 'low' rating will be appropriate for most hedgerows replacement schemes, but there may be instances where a higher rating will better reflect the difficulty of recreating a particular type of hedgerow. For example, to replace a particularly species-rich hedgerow, or to replace a local hedge type with features that are more difficult to recreate, such as the hedges associated with tall, steeped-sided banks commonly found in Devon, or where there are management challenges such as a high deer population. Organisations such as HedgeLink (www.hedgelink.org.uk) provide material that should help with judging the difficulty of creating or restoring different hedge types.

Time to create, restore or enhance

33. Estimates of the time it takes hedgerows to achieve a pre-agreed target quality are given in Table 4. The multipliers cited are calculated using the 3.5% annual discounting rate adopted by the Defra pilot metric (Defra, 2012).

34. The Table 4 values are indicative assessments and the actual time value applied in calculations should take account of the specific circumstances of each scheme. This point particularly applies to restoration or enhancement, where the time multiplier needs to reflect the measures proposed and the time it will take a hedgerow, subject to these measures, to reach its pre-agreed target quality.

35. The risk multiplier value of '1' applies where hedgerows have been created, restored or enhanced if the target quality has been successfully achieved before the hedgerow loss occurs.

[6] The 'difficulty' categories (and the relevant multipliers) are: 'very high' (x0.1); 'high' (x0.33), 'medium' (x0.67) and 'low' (x1).

Table 4: Time to target condition multipliers for newly planted and restored or enhanced hedgerows

Hedgerow compensation measure	Time to target condition (Multiplier in parentheses)	
	Moderate condition	High condition
Newly planted hedgerow	5 years (x 0.84)	10 years (x 0.70)
Newly planted hedgerow with emergent trees	10 years (x 0.70)	20 years (x 0.49)
Newly planted 'line of trees'	20 years (x 0.49)	30 years (x 0.34)
Restored or enhanced hedgerow	3 years (x 0.90)	5 years (x 0.84)
Restored or enhanced hedgerow with trees	5 years (x 0.84)	10 years (x 0.70)
Restored or enhanced 'line of trees'	10 years (x 0.70)	20 years (x 0.49)

Calculating Hedgerow biodiversity units (HBU)

Building on the Defra pilot metric (Defra, 2012) but recognising the increasing sophistication of biodiversity offset metrics the following formulae are the preferred approach for use in calculating the biodiversity unit value of existing, newly created and restored or enhanced hedgerows. Newly created and restored or enhanced habitats are treated differently because:

- When you enhance habitat it starts with and retains a certain biodiversity value that interventions increase. The risks primarily relate to the time to achieve the uplifted state and difficulty of doing so.

- When you create new habitat you lose the original habitat and start afresh, so the risks apply to the whole value of the created habitat.

Equation 1: Pre-impact (T_0) biodiversity value

$$T_0\ Baseline\ HBU = L \times Q_D \times Q_C \times Q_{SC} \times Q_{SS}$$

Equation 2: Post-impact (T_1) biodiversity value for hedgerow creation

$$T_1\ Creation\ HBU = L \times Q_D \times Q_C \times Q_{SC} \times Q_{SS} \times R_D \times R_T$$

Equation 3: Post-impact (T_1) biodiversity value for hedgerow restoration and enhancement

$$T_1\ Total\ HBU\ after\ Enhancement = ([\{\langle L_{T1} \times Q_D \times Q_C\rangle - \langle L_{T0} \times Q_{DT0} \times Q_{CT0}\rangle\} \times \langle R_D \times R_T\rangle + \langle L_{T0} \times Q_{DT0} \times Q_{CT0}\rangle] \times \langle Q_{SC} \times Q_{SS}\rangle)$$

Where:

HBU	Hedgerow biodiversity units	Q_{SC}	Spatial – connectivity (a quality measure)
L	Length of hedgerow (metres)	Q_{SS}	Spatial – strategic position (a quality measure)
Q_C	Condition (a quality measure)	R_D	Difficulty (a risk factor)
Q_D	Distinctiveness (a quality measure)	R_T	Time to target condition (a risk factor)

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Annex A: The 'Biodiversity Metric Consortium'

The workshop participants, who form the consortium, are:

Name	Affiliation
Julia Baker	Balfour Beatty
Tom Butterworth	WSP
Rachel Hoskin	Footprint Ecology
Andy Fairburn	BBOWT
David Lowe	Warwickshire County Council
Louise Martland	Environment Bank
Suzanne Perry	Natural England
David Prys-Jones	HS2 Ltd
Philippa Richards	HS2 Ltd
Neil Riddle	Forestry Commission
John Simmons	AECOM
Jon Stokes	Tree Council
Claire Gregory	Department for Transport (DfT)

The following were invited, but were unable to attend or declined the invitation:

Name	Affiliation
Matthew Jackson	BBOWT
Kerry ten Kate	Business and Biodiversity Offsets Programme
Peter Miller	HS2 Ltd
Luci Ryan	Woodland Trust
Jo Treweek	Treweek Environmental Consultants
Robert Wolton	Independent Ecological Consultant

Additional comments on a draft of the revised metric were also received from:

Name	Affiliation
Rachel Hackett	The Wildlife Trusts
Robert Wolton	Independent Ecological Consultant
Barry Wright	Dryad Ecology

Annex B: A key for determining if a feature is a hedgerow and the hedgerow type

A simplified key to determining whether or not a feature is classed as a hedgerow, and if so, what type, is given below. This key is taken from Figure 4 of the 'Hedgerow Survey Handbook (Defra, 2007).